CALIFORNIA AND WESTERN MEDICINE

Owned and Published Monthly by the California Medical Association
FOUR FIFTY SUTTER, ROOM 2004, SAN FRANCISCO
ACCREDITED REPRESENTATIVE OF THE CALIFORNIA AND NEVADA MEDICAL ASSOCIATIONS

VOLUME XXXVII AUGUST, 1932 No. 2

THE OBESITIES—THEIR ORIGINS AND SOME OF THE METHODS OF REDUCING THEM *

By LEWELLYS F. BARKER, M. D.
Baltimore, Maryland

THOUGH not much in vogue before the nineteenth century, the term "obesity," derived from the Latin word *obesus* ("that has eaten itself fat, stout, plump") began to be used in English early in the seventeenth century as a name for excessive fatness or corpulence. The derivation of the term indicates that, in the minds of those who introduced it, the condition so designated depended upon eating too much.

MEDICAL DEFINITION OF OBESITY

Though every layman recognizes marked corpulence as obesity, there are often outspoken differences of opinion among nonmedical observers as to what constitutes optimal weight, that is to say, the point where overnutrition (obesity) and undernutrition (emaciation) respectively begin. Nor is the layman alone in doubt; physicians with their scientific training have had difficulty in laying down any general rule that will sharply separate overnutrition from normal nutrition and from undernutrition in all persons. There are so many individual differences in body-build and in constitutional make-up that a rule admittedly applicable to one type would be found to be inapplicable to a second contrasting type. Obviously, therefore, in formulating a medical definition of obesity, allowance must be made for these different types; any conception formed of what constitutes optimal or ideal weight must be regarded as abstract, and a fairly broad zone (perhaps a zone of ten per cent) must be left on each side of it before a weight should be regarded as either too high or too low.

In persons who are much overweight, functional disturbances of one sort or another are prone to appear; in those who are only moderately overweight, no disturbance of function may be noticeable, but on account of the tendency to progress, the obesity may be expected sooner or later to impair functional capacities.

Body weight is definitely related to age, to stature and, in less degree, to sex. From medical-actuarial tables and from long empirical observation, the average weights of healthy adults of different heights have been recorded, and rough-and-ready methods of determining quickly the ideal weight of adults from their height have been devised. Among these the three formulae suggested by Bernhardt, Broca, and Guthrie, respectively, are perhaps most often used.

According to the *formula of Bernhardt:* Ideal weight in kg.=

$$\frac{\text{height in cm.} \times \text{chest circumference in cm.}}{240}$$

To allow for differences in body-build, age, sex, and race, weights 15 per cent or 20 per cent above or below those resulting from application of this formula are not regarded as abnormal.

According to the simple *formula of Broca:*

Ideal weight in kg.=height in cm.—100

Differences of plus or minus 8 per cent or 10 per cent are not looked upon as abnormal.

According to the *formula of Guthrie:* Ideal weight in lbs. = 110 + (5.5 × number of inches taller than five feet.)

This formula, devised by the late Dr. Clyde G. Guthrie when he was on the medical staff of the Johns Hopkins Hospital, is the one I ordinarily employ. Weights 10 per cent above or below the abstract ideal weight thus indicated are considered to be still within normal limits.

A weight 25 per cent above ideal may be called "slight" obesity; one 35 per cent above, "distinct" obesity; one 50 per cent above, "moderately severe" obesity; one from 50 to 100 per cent above, "very severe" obesity; and one more than 100 per cent above (only rarely seen), "extreme" obesity.

NORMAL FAT METABOLISM

To understand why one person is of normal weight, another fat, and a third lean, we must be familiar with some of the more important chemical studies bearing upon the metabolism of the body in health and in disease. Let us consider first, then, the fat metabolism of normal persons.

In a healthy human being of normal weight, approximately one-sixth of that weight is fat stored as reserve material for supply of energy to be called upon in case of need. Thus, a normal man weighing 70 kilograms will contain, say, 12 kilograms of fat, of which 9 kilograms will be

* Address given under the auspices of the Scripps Metabolic Clinic at La Jolla, California, January 9, 1932.

stored in certain reserve depots of fat, thus preserving a potential combustion value of eighty thousand calories or enough to cover the total energy requirements of his body for about a month. The normal depots of fat storage lie in the connective tissues of the trunk and the extremities, especially in the subcutaneous tissues. The distribution of the stored fat varies somewhat with sex and, as we all know, in different persons of the same sex. In men, fat tends to be deposited in the subcutaneous tissue of the neck and of the abdominal wall, whereas in women the breasts, the abdomen, the buttocks, and the thighs are sites of predilection for fat storage.

Human and animal fats consist of triglycerids of oleic, palmitic and stearic acid; they are derived from the foods ingested, not only from the fats eaten, but also from the carbohydrates and from the amino-acids of the proteins of foods through chemical transformations within the body. In fat metabolism, a most important rôle is played by the ferment lipase, which, besides having the power to split fats into their component fatty acids and glycerin, can also, in certain circumstances, act in the reverse direction and synthesize these components to neutral fats. It now seems probable that the fats of the foods on absorption by intestinal epithelium are split by lipase and are again resynthesized before passing into the chyle to go over into the blood. Just where the carbohydrates and the amino-acids of the foods are transformed into fats has been much discussed; that, however, both the liver cells and the fat cells of the connective tissues are sites of such transformation seems certain, since both lipase and glycogen are demonstrable within them.

The available calories of the food ingested represent the potential energy added on eating: for 1 gram protein, 4.1 calories; for 1 gram carbohydrate, 4.1 calories; and for 1 gram fat, 9.3 calories. From the foodstuffs taken in and assimilated, the structure of the body is maintained and the energy involved in muscular work and in the production of heat is supplied. A certain minimum of protein is necessary for growth, regeneration, and adaptation of the bodily tissues, for the production of external and internal secretions, and for the maintenance of the blood. The energy for work and heat production is derived from oxidations within the body of the carbon and hydrogen of fats, carbohydrates and amino-acids. If more energy is used than the food supplies, the stores of the body are called upon and the body loses weight; if less is used than the food supplies, the surplus is stored as fat and the body gains weight. Changes in the water and salt content of the body can be responsible temporarily, it is true, for decrease or increase in body weight, a fact that may for the moment be disregarded, since, "for the long pull," body weight is determined, according to the law of conservation of energy, by the balance between caloric intake and caloric expenditure.

Now, in healthy adults, equilibrium may be maintained between caloric intake and caloric expenditure, the body weight remaining practically constant for years, or even for decades, through unconscious intracorporeal regulation. The needs of the body for maintenance and expenditure are so exactly covered, the appetite and food intake on the one hand and the muscular exercise indulged in on the other are so accurately fitted into the bodily economy that there is no impairment of the content of body protein and no net gain or loss of stores of fat and carbohydrate. Obviously, in such persons, some infraconscious regulatory contrivance must be constantly at work for the maintenance of balance, for there are other persons who, though they satisfy their appetites for food and obey their instinctive impulses for exercise and work, either grow fat or emaciated, and to maintain balance are compelled consciously to intervene in a regulatory process.

The regulating contrivance that maintains balance unconsciously in the healthy appears to be partly neural, partly endocrine. The principal *neural* regulatory centers lie in the diencephalon (interbrain) and are made up of a number of adjacent areas (in the hypothalamus) that govern hunger, thirst, heat-formation, and carbohydrate-, fat-, salt-, and water-metabolism; these centers are kept labile by the integrity of the cerebral hemispheres, and they exert their influence upon the fat cells through vegetative paths that run downward through the axis of the nervous system and through the peripheral nerves (cerebrospinal and sympathetic) to the fat cells. The endocrine regulation is probably very complex, hormones from the thyroid, the hypophysis, the islands of Langerhans of the pancreas, the gonads, and the suprarenals, passing into the blood to act upon other endocrine glands and upon the fat cells, partly directly upon the latter, partly through the intermediation of the nervous system. The thyroid hormone has a direct effect upon the metabolism of the body at rest (measured as the basal metabolic rate) and the hypophyseal hormone has an influence upon the energy spent in digestion and assimilation (so-called specific dynamic action of foods). Clues are gradually being obtained as to the nature of the influences of other hormones, too, upon energy equilibrium in the body, but knowledge in this domain is still too meager to make discussion of it at this time profitable.

METABOLIC CONDITIONS THAT RESULT IN OBESITY

Obviously, from what has been said, if the potential energy of the food eaten and assimilated exceed the energy expended in resting metabolism, in muscular work, and in the production of heat, that is to say, if the total caloric intake exceed the total caloric output, a positive balance will result and weight will be increased owing to storage of fat. In the last analysis this is true of every form of obesity; accordingly, one may say that each person who is obese has eaten more than was required to meet the expenditures of energy that he has made. That statement unqualified might, however, be very misleading, for it might spread the view that obesities are due always to

gluttony on the one hand or to laziness on the other! Though gluttony-obesity is well known and laziness-obesity also, both being referred to often as "exogenous" obesity, we must not forget that there may be for their origin certain "endogenous" components also that account for excessive or perverted appetite, for failure of satiety on eating, for lack of impulse to exertion, or for other disturbances of function that lead to failure of the mechanism that normally maintains unconsciously the energy equilibrium of the body.

Many persons grow fat though they eat less than do other persons of the same sex, age, and height who do not fatten; and many grow thin on diets that suffice to maintain normal weight in others who seem equivalent. Why is it that some persons complain that everything they eat turns to fat, or that others maintain that no matter how much they eat of no matter what kinds of food, they cannot gain weight? These ideas are not always wholly erroneous, though on studying the actual food intake of the complainants we find that sometimes they are. Thus, but few people realize how little food above actual daily needs will, in time, lead to obesity; for example, a person who takes three pats (one ounce) of butter, or its equivalent, extra per day above his needs may gain a pound in weight in two weeks or twenty-five pounds in one year. Nor can one easily take enough extra exercise to burn up an extra intake of fat; as an illustration, Benedict has pointed out that the working off of one pat of butter (one-third ounce), or its equivalent, requires an amount of muscular activity equal to that involved in climbing from the bottom to the top of the Washington monument!

Eating habits, methods of cooking, and certain occupations have much to do with the size and the quality of the food intake. If one associate with heavy eaters or with light eaters, one's own habits may, through the examples set, undergo change. Some cooks use larger amounts of fat (butter, oil, lard) in cooking than do others. Butchers, bakers, and restaurant managers are prone to be large eaters because of the special opportunities of their occupations. Professor Alonzo E. Taylor thinks that America, on the whole, is in danger of an increasing incidence of obesity and of its sequels because the national income has been rising, attractive foodstuffs are available in extraordinary variety and profusion, and economic restraint on eating is lacking, except in the poorest classes; he urges the importance of developing influences that will restrain or counteract the tendency of the masses to grow fat, though I daresay some of you are saying to yourselves that, possibly, if the existing economic slump continue long enough, the cause of his anxiety may soon be removed!

That obesity is, in many persons, due to an inherited disposition to store excess of fat seems certain, for obesity "runs in families"—the fatty phenotypes being determined by their genotypic dispositions. Instead of being able, like normal persons, to trust their instincts with regard to the intake of food and liquids and with regard to physical exercise, these persons have faulty automatic infrapsychic regulators of their body weight and, if they are to prevent the development of obese phenotypes, they must learn how to inhibit the influences of their anomalies of constitution by consciously imposing restrictions upon themselves that are out of accord with some of their instinctive feelings and desires.

The inborn disposition to obesity may be very complex in its nature; it may often be impossible in a given person to decide in how far one or several conceivable congenital factors may be concerned (abnormal regional or general lipophilia of the fat-storing connective tissue; abnormal regulative hypothalamic nerve centers or vegetative conduction paths; abnormal endocrine glandular activities with lowering of basal metabolic rate or diminution of the specific dynamic action of foods; abnormality of sensational life with demand for excessive food and drink; abnormal dislike of physical exercise or preternatural fatigability upon attempting it).

Persons born with normal genotypes and whose regulatory systems for maintenance of proper body weight have been adequate may become obese owing to changes in the nervous system or in the endocrine apparatus resulting from spontaneous disease or from surgical operation. As examples, I may cite (1) the extraordinary obesity that sometimes follows epidemic encephalitis (with involvement of the hypothalamic region), and (2) the obesity that develops in women after removal of the ovaries, or in men after castration.

Among the *obesities of endocrine origin* (many of them endogenous) I may mention:

1. *Dystrophia adiposogenitalis,* associated often with tumor or other disease of the hypophysis cerebri, with defective development of the genitalia, and with loss of the specific dynamic effect of protein and other foods (some believe that this obesity is not due to the hypophyseal lesions but to injury of the adjacent hypothalamus).

2. *Hypothyroid obesity,* associated with lowering of the basal metabolic rate and sometimes with myxedema.

3. *Hyperinsulinar obesity,* associated with hypoglycemia and greatly increased appetite for food. Occasionally it occurs in carcinosis of the islands of Langerhans (Wilder).

4. *Hypogonadal obesity,* associated sometimes with heterosexual phenomena.

5. *Hyperinterrenal obesity,* associated with hyperfunction (sometimes tumor) of the suprarenal cortex and, in adult life, with marked hypertrichosis.

6. *Adiposis dolorosa (Dercum's disease),* associated with asymmetrical painful nodules, asthenia and mental symptoms (alterations in thyroid, hypophysis, and gonads at autopsy).

Among the peculiar *obesities of neural origin,* in addition to the hypothalamic forms already referred to, may be mentioned (1) the fatness of the lower half of the body (with marked absence of fat in the upper half) in so-called *lipodystrophia,* and (2) the fatness of one lateral half of

the body (with leanness of the opposite side), the so-called *unilateral obesity*. In these neurogenic obesities the metabolism in the fat cells of certain regions of the body only is pathologically disturbed by nervous influences, whereas the strange regional accumulations of fat seen in some of the endocrinogenic obesities are assumed by some to point to exaggerations of primary regional lipophilic tendencies.

Studies of intermediary metabolism by Kugelmann indicate that in the obese the available glycogen stores in the liver and in the muscles are less than normal, owing to disturbances of the vegetative nervous system; apparently, since the obese burn carbohydrates in diminished amounts and do not excrete carbohydrates, they must shove them into their fat depots where they are converted into fats.

As to whether a fat cell is to synthesize glycogen to fat and hold it, or is to deliver fat to the lymph and blood after splitting by lipase, is now thought to depend upon changes in cell organization in which there is spatial separation, or union, of substratum and ferment due to the construction, or to the breakdown, of plasmatic partitions, that is to say, to colloidal chemical reactions with formation of gels and sols.

It is well known that such reactions are associated with changes in the local binding of water. It is very interesting, as Lichtwitz has pointed out, that insulin increases both water and fat reception by the tissues, whereas thyroxin simultaneously dehydrates tissues and diminishes the amount of fat stored in them. When we learn why it is that in many people normal weight is maintained unconsciously despite marked variations in bodily activity and in food consumption, and when we come to understand fully the happenings in fat cells and just how these happenings are modified by neural, by chemical, and by physical influences, we shall have progressed far toward a true understanding of the conditions that underlie obesity.

RECOGNITION OF THE DIFFERENT TYPES OF OBESITY

In clinical medicine, it is not with a single obesity but with a whole series of obesities (differing more or less from one another) that we have to deal. In their production they have all had one thing in common, namely, a positive energy balance; that is to say, there has been greater caloric intake than caloric expenditure. But the reasons for this discrepancy in energy values may, as we have seen, be very different in the different types, and it is the physician's duty in each case that he studies to attempt to unravel, as best he can, the tangled skein of etiology and pathogenesis.

The carefully taken *anamnesis* will throw light upon inherited dispositions, as well as upon personal habits of diet and exercise; in it, too, will be recorded the history of growth, of sex development, of changes in weight, and of earlier diseases (especially infections, nervous maladies, and endocrinopathies).

The *physical examination* of the completely nude patient will show at a glance the general and the regional distribution of the fatty tissue and will often give immediate diagnostic clues to the special type under observation. Thus, the girdle obesity with small genitalia and delicate acra, and with lack of development of secondary sex characters in a person of small stature, will betray immediately the so-called dystrophia adiposogenitalis. Again, an obesity in a person who looks prematurely senile, who has a dry skin, who has pudgy hands and pads of fat above the clavicles, and whose face is deeply wrinkled, will make one suspect at once a hypothyroidism. Masses of fat about the hips along with general hypotrichosis (and, in the male, small testes, large breasts, and a feminine type of voice) will make hypogonadism (eunuchoidism) leap to the mind. On the other hand, a massive obesity with extreme hypertrichosis, in the absence of signs pointing definitely to other endocrine organs, will make one consider the possibility of hyperfunction of the cortex of the suprarenals. Lipodystrophy and Dercum's disease are two other types that can be recognized promptly. A plethoric obesity, in the sense of Immerman, is distinguishable from an anemic obesity when a patient enters the consulting room.

That a *general diagnostic survey* should be made of all the organs and their functions, including tests of the secretions and of the basal metabolic rate, goes without saying. For in obesity an examination of the blood may reveal a marked hypoglycemia pointing to hyperinsulinism, or a hyperglycemia suggestive of a diabetes mellitus incipien; a determination of the respiratory quotient may prove that the basal metabolic rate is low; or a charting of the visual fields with the perimeter may discover a wholly unsuspected bitemporal hemianopsia suggestive of an enlarged pituitary gland or of a tumor. Moreover, one wants to know, from the beginning, how many of the complications and sequelae of obesity are present or in prospect. Is there much embarrassment of the circulation, and, if there is, what factors are concerned in it? Are the peripheral arteries thickened and is the blood pressure high or low? Has the patient been susceptible to bronchitis or to bronchopneumonia? Are there herniæ or hemorrhoids? Is the liver enlarged or have there been signs of gall-stones or of cholecystitis? In men we ask about sexual libido and potentia; in women, about amenorrhea and premature menopause. Has there ever been sugar in the urine? This is important since diabetes mellitus is nineteen times as frequent in the obese as in persons of normal weight. On examination of the nervous system, we look for signs of a neuritis, of a preëxistent encephalitis, or of an incipient cerebral atherosclerosis. Subtly, too, we estimate the psyche of the patient (his intellectual status, his emotional tendencies, and his power of will).

Only after collecting data by this kind of survey, considering them carefully, and arriving at as accurate and as multidimensional a diagnosis as is possible in the circumstances in which one

is compelled to work, should one pass on to decisions as to the treatment to be applied. This therapy should be planned in the best interests of the patient as a whole, and, in the making of the plan, there should be no neglect of any part of the multidimensional diagnosis.

THE TREATMENT OF THE OBESITIES

We are as yet far removed from our ideals of treatment of the obesities from the etiological and pathogenetic standpoints. Still, real progress has been made toward the realization of these ideals during the past three decades, and already the therapeutist who carefully differentiates types can intervene with greater success and satisfaction than the practitioner to whom obesity is "just fat." Even when treating the cases of mild obesity, it is always advantageous to keep etiological factors in mind.

Young people are better to be a trifle over rather than under normal weight; for a little plumpness is not only becoming to them, but is some protection against infection with tuberculosis and against functional nervous disorders. The prevailing style of emaciation among débutantes is a distinct menace to the health of these young women, and every effort should be made to change the "style."

In people of thirty-five years or older, it is better to be a trifle under than over normal weight, for the general human tendency is gradually to grow stouter from middle life onward into the sixties.

The prevention of obesity would be given more attention if people realized how much easier it is to avoid gaining an excess of weight than it is to reduce the weight once it has been put on. In families with disposition to obesity, especially, the family doctor should watch every member and, in his periodic surveys of the family health, he should make sure that diet and exercise are suited to individual needs.

In reduction cures the plan adopted should vary according to the degree of obesity, the temperament of the patient, and the presence or absence of complications (like myocardial weakness, high blood pressure, or renal disease). In all cases, however, dietetic measures should come first, along with adjustment of motor activities. Other measures, like hydrotherapy, endocrine therapy, pharmacotherapy, radiotherapy, and surgical intervention, should be considered and adopted only after the possibilities of a scientifically applied dietotherapy have been exploited.

Dietotherapy.—In arranging the diet of an obese patient the following points merit attention:

1. The diet should be such as to insure a negative energy balance.

2. The food ingested should contain enough protein (especially animal protein) to avoid nitrogen loss and to give all varieties of amino-acids necessary for optimal cell life.

3. In the food intake there should be an abundance of vitamins A, B, C, D, E, G, and of mineral salts, especially iron and calcium.

4. There should be sufficient bulk to the diet to aid in satiety and to prevent constipation.

5. The water intake and the sodium chlorid intake should be regulated according to individual needs; this is of especial importance in the so-called salt-and-water obesity in which there is a marked hydrophilic tendency of the lipophilic tissues.

6. The personal preferences with regard to foods should be given consideration in as far as it is possible to do so without prejudicing the success of the treatment. The cure should involve the least possible hardship for the patient and should be so arranged that the patient will be willing to continue the diet best suited to him, not only until excess weight has been lost, but afterward also.

7. No responsibility for a dietetic cure should be assumed unless the patient will promise to weigh himself weekly, keep a record of his weight and, in general, coöperate in the treatment.

In cases of *mild obesity* the experienced physician can easily place the coöperative patient on a diet (in his own home) that will suffice without the use of food scales and without any elaborate calculations of caloric intake and caloric expenditure. Education to the moderate ingestion of clear soups, lean meat, chicken, fish, green vegetables, and fruits, with abstinence from sugars, candies, and other sweets, nuts and visible fats and with restriction of starchy foods, of common salt and of total fluid intake, will soon yield satisfactory results in the chart of weekly weights. The patient should be told neither to strive for nor to expect a rapid reduction of his weight, but to be content with a gradual loss over a period of months. He should know, too, that sudden losses or gains mean merely changes in the water content of the body, not changes in amount of fatty tissue; the sudden loss of a few pounds through strenuous tennis, for example, is likely to be made up again within a day or two through increased water intake.

In all cases of *severe obesity* more precise methods of work are desirable, and wherever possible the patient should enter a hospital (1) for the work preliminary to the decisions as to dietary restriction and (2) for observation afterward to insure the negativity of energy balance, as well as the compatibility of the diet with the patient's general state. Here the first thing to do is to determine, at least roughly, the daily energy expenditure of the patient in order that the diet may be made of less caloric value so that a negative energy balance will be established, thus compelling a gradual reduction of body fat. We determine the basal metabolic rate (respiratory quotient when fasting and at rest) and compare it with the average for sex, age, height and weight (in F. G. Benedict's tables) to see whether it is low or high. The respiratory quotient also permits us to calculate the number of calories produced daily by the standard or basal metabolism:

R. Q.	Calories per litre of oxygen
0.711	4.72
0.800	4.83
0.900	4.95
1.000	5.07

Thus, if the R. Q. is 0.800, the daily calorie production in the basal metabolism is obtained by multiplying the total volume of oxygen in liters (used during the time of the experiment by 0.8 and then calculating the amount of transformation for the whole twenty-four hours.

Next one adds the number of calories that correspond to the specific dynamic action of foods (best actually determined, since in some obese persons this is diminished; normally it amounts to about 10 to 15 per cent of the basal requirement).

Finally, one adds the caloric expenditure estimated for exercise and occupation and heat regulation (from tables) and so has approximately the total caloric expenditure of the patient for twenty-four hours.†

Now I am not silly enough to think that any such elaborate process of calculation is likely to be adopted by men in general practice. They must have some simpler way of estimating caloric needs. As a matter of fact, for the vast majority of cases it will suffice for practical clinical purposes to assume that the average food need (in calories) for adults doing light work = ideal weight in kilograms x 35 or = ideal weight in pounds x 35/2.2.

A diet must next be planned with a caloric intake that would be one-fifth or one-third less than a maintenance diet for a person of normal weight.

Lichtwitz gives the following useful table:

Ideal weight in kg.	35 calories per kg.	Calories after subtracting 1/5	1/3	1/2
80	2800	2200	1900	1400
75	2600	2100	1700	1300
70	2400	1900	1600	1200
65	2300	1800	1500	1100
60	2100	1700	1400	1100
55	1900	1500	1300	900

No visible fat is permitted in the food and not more than 20 to 30 grams may be used in cooking. Pastries, candies, nuts, and beer are forbidden. About 100 grams of protein may be given (lean meat, cottage cheese, skimmed milk) and the rest of the calories in fruits (unsweetened) and leafy green vegetables. Bouillon is permitted, but no thick soups. Salads (with lemon juice, but without oil) are also given. Small quantities of potato and of Graham bread may be added if the total calories estimated are not exceeded.

I have often found it well to begin with the still stricter diet introduced by Frank A. Evans and his associates in Pittsburgh. They give one gram of protein per kilo of calculated ideal body weight and 0.6 gram of carbohydrate per kilo in the form of 5 per cent vegetables, and fruits, thus providing for bulk. In addition, from 8 to 10 grams of fat are permitted daily, and every other day 100 cubic centimeters of milk, 100 cubic centimeters of orange juice, and some yeast; milk and the leafy green vegetables are important as "protective foods." Some viosterol is administered each day and an adequate supply of inorganic salts (not provided for in the food) is given as Tyrode's solution (made without dextrose). When patients complain of hunger while on this diet, they are given some water to drink.

The caloric intake (under 600 calories) on this strict Evans diet (consisting of 50 grams of protein, 26 grams of carbohydrate, and 27 grams of fat for a patient five feet tall) is, of course, far below the caloric expenditure of any patient even when at rest. As the diet supplies, however, sufficient protein (containing the eighteen different amino-acids) to prevent injury to the body proteins, sufficient carbohydrates to help maintain the protein intake, sufficient mineral materials, and sufficient vitamins (including the fat soluble A, D, and E and the water soluble B, C, and G), the patient suffers no harm and of necessity burns up a definite amount of his stored fat every day. One patient received for *breakfast* one egg and one ounce of bread; for *lunch,* one egg and four ounces of green vegetables; for *dinner,* one cup of bouillon, three ounces of lean meat and four ounces of green vegetables over a period of ten weeks with a loss of thirty-seven pounds.

Though patients with severe obesity can be kept for as long as four months on the Evans diet and still maintain their body protein, it has not seemed to me to be desirable to prolong its use (with rare exceptions) beyond an initial period of from four to six weeks. The definite and rapid loss of weight from the beginning is very encouraging to the patient, and increases his willingness to make the effort to acquaint himself with the principles of dietotherapy and to learn how to manage his intake of foods and fluids in his own best interests.

Those who work in metabolic clinics have long since learned that education of the patient as to mode of life (including diet, exercise, and rest) is the best service that can be rendered; indeed, the results otherwise of a stay in a metabolic clinic are wholly secondary in value. In this connection I was much pleased to read, in a recent number of the *Scientific Monthly,* a semi-popular article by Gray and Stewart on "Quantitative Diets Versus Guesswork in the Treatment of Obesity and Diabetes" in which these workers in the diet laboratory of the medical department of Stanford University Hospital described their simple methods of educating patients to the use of measured diets. I can recommend to general practitioners the perusal of this article, for I feel sure they will find it helpful in getting a patient suffering from a metabolic disorder (obesity, diabetes, renal disease) well started on the way to the diet best suited to his condition; but also, and this is of even greater importance, adoption of the methods advised will go far toward insuring the maintenance of the proper diet when the patient must be placed upon his own responsibility.

After the preliminary reduction of weight, therefore, by means of a strict Evans type of diet, it is my custom to educate the patient in the use of diets that will reduce him gradually, rather

† For precise research work, the methods mentioned will scarcely suffice; for references to the exact methods of the investigative "metabolism cage," the recent papers of Newburgh and his associates may be consulted.

than rapidly, pointing out to him that the steady loss of one pound per week will make him twenty-five pounds lighter at the end of six months. This slower method is supported by Wilder also, who urges a reduction that is gradual enough not to impair the strength of the heart or of the nervous system, not to make the patient too uncomfortable, and, above all, not to make him lose confidence in the treatment and stop it. After securing a loss of ten or twenty pounds, one may be satisfied thereafter with the loss of one pound a week.

In the more liberal diets permitted after the preliminary period of very strict diet, the protein, because of its high specific dynamic action, may be increased to, say, 100 grams and the total caloric intake to, say, 1000 or 1500 calories, provided their total is well within the total caloric expenditure.

In arranging the diet for an obese patient, it is often well to give five or six small meals rather than three large ones. Thus, *breakfast* may consist of orange juice or grapefruit juice, tea or coffee with a little milk, but without sugar (saccharin may be used for sweetening if desired), and in mild obesity one egg and one slice of toasted graham bread. In the *mid-forenoon,* a raw apple or a cup of bouillon may be permitted.

The *mid-day meal* may consist of vegetable soup, two slices of lean roast meat, two varieties of cooked vegetables (5 per cent), green salad with lemon juice (but without oil or mayonnaise), and one demitasse of coffee.

In the *mid-afternoon* a cup of tea or coffee with a little milk, and one graham cracker are allowable. The *evening meal* may consist of thin vegetable soup, boiled green vegetables, salad of lettuce and tomatoes, cottage cheese and a graham cracker, and raw or cooked fruit (unsweetened). At *bed time,* a raw apple may be eaten if desired.

Such a diet, if found to be rather too liberal, can have its quantities (in the single helpings) reduced, or better still, as is the custom in some of the European clinics, once each week the patient has a *skimmed milk* day (say, 1200 cubic centimeters or about 600 calories divided into six portions given at two-hour intervals); and also, once a week, a fruit and vegetable day (500 grams of fruit, 300 grams of stewed green vegetables, and 300 grams of salads made of leafy green vegetables and fruits—some 500 calories in all). Or, instead of such skimmed milk days and fruit and vegetable days, one may, as Grote and Calo suggest, plan for one *tea and meat day* (five cups of weak tea during the day, and four helpings of lean meat to a total of 600 to 700 calories); or for one *tea and fruit day* (six cups of weak tea flavored with lemon together with raw apples, pears, etc., to make the total caloric intake 300 for the day). Such semi-starvation days (twice a week) obviously permit of a somewhat more liberal diet on the other five days of the week.

The restriction of salt intake is often harder for patients to bear than restriction of water intake and of food intake. The various substitutes for sodium chlorid are of some help in flavoring soups, but for other foods the admixture of parsley, onions, chives, dill, and vinegar gratifies the taste more. (See H. Strauss.)

As adjuvants of dietotherapy, muscular exercise (walking, games, calisthenics, resistance contractions, etc.), massage, and hydrotherapy are often recommended as parts of obesity cures. Muscular exercise is advantageous to general health and it undoubtedly increases caloric expenditure. But the wise physician will individualize, remembering that exercise increases appetite, and, if this exercise be violent, it throws strain upon the heart muscle that may have already suffered from the long-continued obesity. Massage, though it increases the sense of well-being and may find an appropriate place in an "obesity cure," does nothing toward the removal of fat (either general or regional) in the patient, though it may do so for the masseur! Hydrotherapy, too, is useful for its general effects upon the nervous system, but it does not reduce the amount of fatty tissue; the loss of weight during sweat baths is due, of course, to loss of water, not to loss of fat.

Endocrine Products in the Treatment of Obesity.—Though the majority of the obesities will yield satisfactorily to rearrangement of the general mode of life and to the restriction of the intake or carbohydrates, fats, water, and sodium chlorid by the technique I have referred to, medical practitioners, since the advent of endocrinological studies and of organotherapy, have been all too prone to make use of thyroid products and of other glandular derivatives in cases in which these substances are not at all necessary. My own experience confirms that of the majority of metabolic workers in the view that most of the patients exhibiting obesity, if they will willingly and seriously coöperate in the application of a therapy that is exclusively dietetic, exertional, and psychotherapeutic, will easily secure a satisfactory reduction in weight through reform of daily habits without the aid of any endocrine therapy. The recent studies of Evans, Newburgh, Strouse, Wilder and others in this country, and those of Lichtwitz in Germany, of E. Möller in Scandinavia, and of Grote and Calo in Switzerland, are all corroborative of this view, not only for the treatment of outspoken gluttony obesity and laziness obesity, but also for that of most cases of obesity of endogenous or constitutional origin.

Still, there are some cases of endogenous obesity in which organotherapy can be applied without harm and, in reality, with advantage, since some endocrine products can increase the basal metabolic rate, some can restore the specific dynamic action of foods when this has been lost, and some can mobilize water and lead to its excretion with resultant lessening, apparently, of the lipophile tendency of certain hydrophile tissues.

Hypothyroidism with marked lowering of the basal metabolic rate is only rarely a factor of great importance in the origin of obesity; by far the majority of obese persons show no marked lowering of the basal metabolic rate. When hypothyroidism really exists, thyroid preparations (tablets of desiccated gland; thyroxin) are peculiarly efficacious.

But when there is no demonstrable hypothyroidism and the obesity is unusually refractory to dietetic measures and to physical therapy, thyroid preparations may sometimes be advantageously used for their pharmacodynamic effects (acceleration of combustion; mobilization of water). Thyroxin of known strength (the preparations of different manufacturers are not equivalent) may be cautiously used, with gradual increase of the dosage if no untoward effects follow its administration. According to Hellfors (1931), about one per cent increase in basal metabolic rate may be expected from the daily oral administration of one-quarter milligram thyroxin (Henning), one milligram thyroxin (Roche), two milligrams thyroxin (Schering), or one tablet thyreoidin (Merck); he often makes use of one-half milligram thyroxin (Henning) four times a day, thus increasing the basal rate by about eight per cent. In persons sensitive to thyroid it may be better borne if injections of foreign protein are given also; Kremer suggests five cubic centimeters of aolan weekly.

Very recently, Noorden has reported the effects of another thyroid preparation, "elityran," prepared by the I. G. Farbenwerke. One tablet corresponds to twenty-five milligrams of thyroid substance. The preparation, Noorden asserts, is free from bad effects when properly used; he got excellent results in thirty cases of obesity, especially in those refractory to other thyroid preparations, as well as in those that exhibited toxic effects on treatment with thyroxin. When thyroid seems indicated, he usually begins treatment with five tablets of elityran per day for two days, followed by a day without any, then by two days of five tablets each, then by two days with none, after which the cycle can be begun again. This dosage of twenty tablets per week may suffice, but in some instances he had to increase the dosage to thirty-five or forty tablets per week with two days per week free from thyroid, on which days the patient is kept upon a diet of fruit and salads, free from sodium chlorid. I have as yet had no personal experience in the use of this elityran therapy, but I expect to try it in selected cases.

Hypophyseal preparations have been used in cases of dystrophia adiposogenitalis, but as a rule without very brilliant results. Some have used anterior lobe extracts (*e. g.,* antuitrin), some extracts of whole gland (*e. g.,* hypototal). More can be expected from subcutaneous than from peroral use; though good results from the latter are reported also, I am rather skeptical. When the specific dynamic reaction of foods has been lost, it is asserted that it can, in some instances at least, be restored by the administration of hypophyseal preparations.

Other increta (gonadal, suprarenal, parathyroid) have been tried in the treatment of obesity, but without striking benefit. In the rare cases of obesity due to excessive production of insulin, deep radiation of the pancreas has been tried (Högler); in hypothalamic forms associated with brain tumor or hypophyseal tumor, both surgical intervention and roentgenotherapy have been used; in eunuchoid obesity, implantations of gonadal tissue have been advocated; and in obesity (with hypertrichosis and virilism) due to adenoma or to hyperfunction of the suprarenal cortex, removal of one suprarenal gland has been performed, in one case apparently with extraordinary benefit. (Koster *et al.,* 1931.)

In conclusion, then, let me again emphasize the primary importance of dietetic and other physical measures (scientifically applied) in the treatment of obesity; all other methods (endocrine, surgical, pharmacal) should receive consideration only after the former have been found to be insufficient.

REFERENCES

Barker, L. F.: States of overnutrition. In his: Clinical Diagnosis of Internal Diseases, N. Y., 3:793-804, 1916.

Benedict, F. G.: The rationale of weight reduction. Scient. Monthly, N. Y., 264-266, 1931.

Bernhardt, H.: New concepts concerning the pathogenesis of obesity and the problems of total metabolism. Endocrinology, 14:209-225, 1930.

Christie, W. L.: Fat children. Practitioner, Lond., 127:29-297, 1931.

Dubois, E. F.: Basal metabolism in health and disease. 8mo. Phila. Lea & Febiger, 1927.

Evans, F. A.: A radical cure of simple obesity by dietary measures alone. Atlantic M. J., 29:240, 1926.

Evans, F. A., and Strang, J. M.: A departure from the usual methods in treating obesity. Am. J. M. Sc., Phila., 177:339-348, 1929.

Falta, W.: Mast- und Entfettungskuren. Wien klin. Wchnschr., 44:644-645, 1931.

Fellows, H. H.: Studies of relatively normal obese individuals during and after dietary restrictions. Am. J. M. Sc., Phila., 181:301-312, 1931.

Gray, H., and Stewart, J. M.: Quantitative diets versus guesswork in the treatment of obesity and diabetes. Scient. Month., N. Y., 46-53, 1931.

Grote, F., and Calo, G.: Ueber Entfettungskuren, Schweiz. med. Wchnschr., 60:579-585, 1930.

Harris, J. A., and Benedict, F. G.: A biometric study of basal metabolism in man. Washington. Carnegie Institution. 266 pages. 1919.

King, J. T.: Basal metabolism; determination of the metabolic rate in the practice of medicine. 8mo. Baltimore, 1924.

Koster, H., Goldzieher, M., Collens, W. S., and Victor, A. W.: Operative treatment for adrenal cortical obesity, Am. J. Surg., N. Y., 13:311-314, 1931.

Kugelmann, B.: Untersuchungen zur Fettsucht als ein Problem intermediärer Stoffwechselstörung. Ztschr. f. klin. Med., Berlin, 115:454-521, 1931.

Lichtwitz, L.: Fettsucht. In: Handb. d. inn. Med. (v. Bergmann & Staehelin), Berlin, 2 Aufl., iv, teil i, 892-942, 1926.

Möller, E.: Results of exclusively dietary treatment in forty-six cases of obesity. Acta med. Scand., Stockholm, 74:341-352, 1931.

Murlin, J. R.: Some controverted questions in nutrition, J. Am. Dietet. Assn., Balt., 6:299-306, 1931.

Newburgh, L. H.: Cause of obesity, J. Am. M. Assn., Chicago, 97:1653-1659, 1931.

Nissler, C. W., Tai, E. S., and Gordon, B.: Some considerations of the etiology and treatment of obesity, N. Y. State J. Med., 31:887-889, 1931.

Noorden, C.: On elityran, with general comments upon thyroid treatment of obesity. Wien med. Wchnschr., 81:23-25, 1931.

Silver, S., and Bauer, J.: Obesity, constitutional or endocrine, Am. J. M. Sc., Phila., 181:769-777, 1931.

Strang, J. M., and Evans, F. A.: The energy exchange in obesity, J. Clin. Invest., Balt., 6:277-289, 1929.

Strang, J. M., McClugage, H. B., and Evans, F. A.: The nitrogen balance during dietary correction of obesity, Am. J. M. Sc., Phila., 181:336-349.
Strauss, H., Praktische Winke für die Kochsalzentziehungskur durch chlorarme Ernährung. 3rd ed., 8mo. Berlin. 1924.
Strouse, S.: Obesity, J. Med., Cincinnati, 11:251-254, 1930.
Strouse, S., Wang, C. C., and Dye, M.: Studies on the metabolism of obesity, J. Am. M. Assn., Chicago, 82:2111, 1924.
Taylor, A. E.: The national overweight, Scient. Month., N. Y., 393-397, 1931.
Tileston, W.: Obesity. In: Endocrinology and Metabolism, N. Y., 4:29-49, 1922.
Wilder, R. M.: The management of obesity, J. Am. Dietet. Assn., Balt., 6:91-100, 1930.

THE PROGRESS OF UROLOGIC SURGERY*

By NATHAN G. HALE, M. D.
Sacramento

ACCORDING to Dorland, "The sum of what is known about the urine is urology." A detailed survey of so comprehensive a field is impossible in the time at my disposal. I shall therefore limit my address to the progress of urological surgery from its inception to the present time: in short, to lithotomy, prostatectomy, and renal surgery.

LITHOTOMY: EARLY PROCEDURE

The oldest branch of urological surgery is lithotomy. Even as early as 1200 B. C., there were Egyptian lithotomists. Their methods, judged by our standards, were crude; the results certainly unsatisfactory. Vesical calculi, crushed by counterpressure from above against a previously inflated bladder, were evacuated by means of buccal aspiration.

Nor was Egypt the only country with urological knowledge. India, one thousand years before Christ, had specialists who accurately described the formation of calculi and performed perineal lithotomies.

Passing westward from India, we find our next outstanding representative in Ammonius of Alexandria (275 B. C.). Ammonius became so expert in stone-cutting for humans that he was given the surname "Lithotomus." He was able to reduce with chisel and mallet the size of stones which were too large to be extracted through the usual lithotomy incision.

LITHOTOMY: LATER DEVELOPMENTS

Celsus, born 100 A. D., was a great urologist. He invented catheters of peculiar shapes to overcome various types of obstructions at the bladder orifice. Celsus was the first to describe urethrolithotomy, and his procedure was not changed for three hundred years. After the first modification, however, there were twelve different changes in the modus operandi.

Until the fourteenth century we (as specialists) were laymen. The monks controlled all other branches of medicine, allowing the lithotomists to function only without the sacred portals. No professional qualms deterred our urological progenitors from advertising. Lacking modern x-ray and photographic equipment and world-wide magazine circulation, these peripatetic lithotomists strung the evacuated bladder stones as pearls about their necks. Control of urology by laymen continued until about the middle of the fourteenth century when, through the unceasing efforts of Germain Colot, the medical profession was forced to admit that the specialty of cutting for stone should be recognized by the guild, and the urologist rose from his former illegitimate status to that of legally adopted child.

The first suprapubic cystotomy was performed by Pierre Fronco in 1560. Although the initial venture was successful, the number of subsequent failures was so great that the operation was discontinued, not to be revived until the nineteenth century.

For centuries the method of crushing bladder stones was to hammer from above against a drill, file, or rod that had been introduced into the bladder through the urethra or perineum. Indeed, so deeply established had this method become that it was necessary to go to a new nation in order to get away from this hammer and tongs method of treating bladder calculi. In the new world, an instrument called the lithrotrite was invented and perfected by James Jacob Bigelow. This instrument made the evacuation of bladder stones a comparatively comfortable procedure for both patient and operator.

PROSTATECTOMY

The first prostatectomy was performed by Covilliar about three hundred and fifty years ago, but the operation did not become immediately popular with urologists. Even as late as fifty years ago, Sir Henry Thomson—eminent urologist though he was—found himself unable to remove prostates successfully. He traveled extensively in the futile attempt to find someone who could perform the feat.

Many changes have been made in method of reducing the size of the prostate. Some of the earlier methods were: ligating the vas deferens; removing the vesicovenous plexus; ligating both internal iliac arteries; performing orchidectomy; cauterizing. Not all these modes have been definitely discarded. Some, previously discarded, were later revived in modified form; while others, notably cauterization, are exceedingly popular at the present time.

Today we are whittling hypertrophies, using greatly improved cauteries of various makes. The exponents of this newer method assure us that the functional improvement has been marvelous; and that the end-results, including the time element, are amazing. Indeed, there are those who believe that this type of procedure will supersede the proved methods of prostatectomy which in the past fifty years have reduced the mortality rate to four per cent. Others feel that it would be unwise to lightly cast aside the proved methods of prostatectomy, methods which have had the

* Chairman's address, Urology Section of the California Medical Association, at the sixty-first annual session, Pasadena, May 2-5, 1932.